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| Sponsor | Nominations must be submitted by an AASHTO member DOT willing to help promote the technology | 1. Sponsoring DOT (State): Utah
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| 1. Name and Title: Stan Burns, Director of Asset Management
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| Organization: Utah Department of Transportation |
| Street Address: 4501 South 2700 West |
| City: Salt Lake City | State: UT | Zipcode: 84119 |
| E-mail: sburns@utah.gov | Phone: 801-633-6221 | Fax:       |
| 3. Is the sponsoring State DOT willing to promote this technology to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative? Yes or No: **Yes** |
| **Technology Description (10 points)** | The term “technology” may include processes, products, techniques, procedures, and practices. | 4. Name of Technology: **Actionable Data – Collect, Organize, and Analyze**  |
| 1. Please describe the technology.

UDOT developed a practice and process to collaborate department wide to collect and organize transportation asset data. Once the common data set existed UDOT found it possible to analyze the data in numerous ways, many of which were not possible prior to the collaborative data collection effort. UDOT can now use the data to drive actions that lower risk, define asset preservation and maintenance needs, and prioritize projects. Under development is the prioritization of funding across asset categories. |
| 6. If appropriate, please attach photographs, diagrams, or other images illustrating the appearance or functionality of the technology. (If electronic, please provide a separate file.) Please list your attachments here.**UDOT\_Background\_Actionable Data.pdf**, including the following:* UPlan map gallery screen shot
* Roadview Explorer screen shot
* Sample Concept Report Summary Sheet
* Cost Savings
* UGate Development Costs
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| **State of Development** **(30 points)** | Technologies must be successfully deployed in at least one State DOT. The AII selection process will favor technologies that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use. | 1. Briefly describe the history of its development.

Most DOTs’ business models involve data collected by multiple departments and are used for a specific purpose. UDOT has tackled this inefficiency with a threefold approach: Collect, Organize, and Analyze.Collect: Multiple departments within UDOT worked together to identify needs and have nearly all assets collected in a single collection effort using LiDAR and photolog technology. Starting in 2012 and continuing in 2014, the outside vendor drives all state roads every two years and delivers a point cloud and photolog of assets that can be seen from a vehicle. Here is a video (link) put together by Mandli Communications showing their process and the assets collected: [*http://vimeo.com/90862702*](http://vimeo.com/90862702). Organize: All the data was stored so it is accessible to UDOT and the public through UPlan and UGate. These interfaces allow users to look at the assets on a map, download assets and their attributes to spreadsheets, and filter data to customized maps for their specific purpose. An image is attached, and here is the link to UPlan Map Center: <http://uplan.maps.arcgis.com/home/>. UDOT is in the process of developing a data warehouse to store the data and make it accessible to every business system UDOT uses.Analyze: Every day new uses for the data are being discovered, now that it is easily accessible. Billboard inventory, shoulders wide enough for bike lanes, project quantity sheets, and geometry combined with crash data are a few of the important analyses that UDOT can now conduct. Tools to facilitate cross-asset analysis and auto generation of asset quantities are currently in development. |
| 1. For how long and in approximately how many applications has your State DOT used this technology?

Approximately two years.Here are a few of the specific examples of how UDOT has used the technology:1. Texas Turndowns and Sloped Concrete end treatments were reviewed for distance from the travel lanes (Clear Zone) to determine a priority of upgrading of the end treatments. Because of data collection and organization efforts, UDOT knew exactly where all these end treatments were and had the data at their fingertips.
2. UDOT had an inaccurate inventory of billboards prior to this collection. Non-permitted billboards were located all over the state, along with ones that were out of compliance, through analysis of the data. UDOT has now been able to start updating their list of approved permits and also work to restructure the billboard permitting process.
3. One of the collected attributes is the average width of roadway shoulders. Analyzing this average width in conjunction with crash data has enabled UDOT to better prioritize which safety projects to fund first for the greatest impact.
4. Prior to this collection effort, UDOT did not possess an accurate inventory of bike lanes or shoulder widths. By analyzing the new data, UDOT was able to determine where all the bike lanes existed and where the shoulders were wide enough to accommodate biking.

Here is a list of software applications that the approach/technology was incorporated into:Photolog: ROW images have been linked into many different web/system applications to allow for display of ROW images within many of UDOT’s applications. Being able to look at an asset on the roadway without having to leave the office saves countless hours and dollars. It also allows for quick decisions since the data is readily available. The application that allows this link is Roadview Explorer, provided by the vendor. It has a URL that can be linked to any application that UDOT has. An image of this application is attached and can also be found here (link): [roadview.udot.utah.gov](http://roadview.udot.utah.gov). usRAP: The safety data will be fed into the usRAP model. The usRAP model assigns a star rating to every section of roadway and identifies where the areas of greatest impact are around the state for safety funding. This will enable UDOT to better use every dollar of safety spending around the state knowing that it is being spent in a very priority-driven way. Here is the link to the Utah Safety Index: <http://bit.ly/1vDjHhw>Auto Generator: UDOT developed a method of pulling the asset data from multiple data sets into design. This process populates the quantity summary sheet for pavement preservation construction projects, concept reports and maintenance activity scheduling. Instead of having to drive up and down the section of roadway looking for all the assets within the limits of a project, a designer or planner can instead run the Auto Generator which will produce a check list of assets and assumptions that they can quickly review and validate. Data collection that took weeks before can be done in minutes in a much safer environment. Here is an example video (link) of how the Auto Generator works: <https://www.youtube.com/watch?v=OO1S3c8k5F0&list=UUNIA7ewyUo-ukjJItWfVNCg> A screen shot of a sample concept report summary sheet is attached. UPlan/UGate: All of the collected data has been shared through UPlan in a map format and through UGate for analysis.  |
| 1. What additional development is necessary to enable routine deployment of the technology?

There is no additional development needed by UDOT to continue using the technology. UDOT developed methods of pulling the data into business systems and displaying the data as part of the collection process. Other state DOTs would need to develop similar methods to achieve similar success of deployment. |

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|  |  | 1. Have other organizations used this technology? Yes or No: **YES** If so, please list organization names and contacts.
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| Organization | Name | Phone | E-mail |
| Idaho DOT | Bill Shaw | 208-745-5608 | Bill.shaw@itd.idaho.gov |
| Arizona DOT | Patrick Whiteford | 602-712-8591 | pwhiteford@azdot.gov |
| Pennsylvania DOT | John Parker | 717-783-1230 | chparker@pa.gov |
| New Mexico DOT | Tamara Haas | 505-795-2126 | TamaraP.Haas@state.nm.us |
| Tennessee DOT | Jeff Murphy | 615-741-3429 | Jeff.murphy@tn.gov |
| Hawaii DOT | Goro Sulijoadikusumo | 808-587-1839 | Goro.sulijoadikusumo@hawaii.gov |
| Alaska DOT | David Oliver | 907-465-8955 | David.oliver@alaska.gov |
| **Potential Payoff****(30 points)** | Payoff is defined as the combination of broad applicability and significant benefit or advantage over other currently available technologies. | 1. How does the technology meet customer or stakeholder needs in your State DOT or other organizations that have used it?

Collect: The single biggest outcome of the technology is that nearly every area of UDOT is working together to define the needs of the Department as a whole, rather than working in silos. The collaborative effort to collect asset data has reduced duplicated efforts and broken down walls that have existed for a long time. Organize: Large amounts of data are now available to anyone with an internet connection. The data can be searched and filtered to meet any need imaginable. Analyze: UDOT is continually finding new and exciting uses for the data that has been collected and discovering ways to work across areas within UDOT to work less in silos and more for the DOT as a whole. For instance, here is a link to the UPlan Map Center displaying the pavement condition of all state highways: <http://bit.ly/1DfogRh>. |
| 1. What type and scale of benefits has your DOT realized from using this technology? Include cost savings, safety improvements, transportation efficiency or effectiveness, environmental benefits, or any other advantages over other existing technologies.

UDOT is continually attempting to quantify the savings from this technology. A spreadsheet of Cost Savings is attached which lists several specific applications and associated savings. There have been many other benefits that have not had a specific dollar amount associated with them. Here are a few examples of the benefits:* Billboards: UDOT never had a very accurate inventory of the existing billboards. For the first time ever, UDOT is able to manage the entire billboard inventory as a whole. This has completely changed the approach to how they are managed. It was found that there were numerous billboards that were out of compliance all over the state. UDOT is now able to work to bring all signs under compliance as a full data set instead of one billboard at a time. Here is a link to the billboard map in UPlan: <http://bit.ly/1Dfmxvo>
* UDOT incorporates MMQA (Maintenance Management Quality Assurance) as part of the approach to maintaining roadway assets. This involves looking at sample sections all over the state and providing an assessment based on the samples. The collected data was loaded into the Operating Management System (OMS), so as the MMQA sample sections were analyzed, they were all analyzed using data that had been collected at the same time, in the same method, and with uniform assumptions. This did not exist before. Data had been collected at random times, by different collection methods, and there was little consistency between analysis efforts.
* Traffic & Safety personnel had been unable to analyze the UDOT roadways in a programmatic approach due to the lack of full data sets. Some of the data, such as shoulder width, UDOT did not have before. By coupling the collected data with crash data, AADT, and other data sets already existing, UDOT has been able to prioritize safety funding. UDOT has been able to identify areas around the state that have potentially unsafe shoulder widths and is working to have these fixed.
* Bike Lanes: The biking community has greatly benefited from the collected data for bike lanes and also for shoulder widths. UDOT has been able to compile various resources and maps that individuals can review to see where bike lanes exist and also where safe shoulder widths exist. A gallery of maps has been created and is found at this link:

[*http://uplan.maps.arcgis.com/apps/PublicGallery/index.html?appid=2d1250231f9e4ec184c983b62e0dcd33&group=9e6283b349a5446c95a63bbbc948e1e9*](http://uplan.maps.arcgis.com/apps/PublicGallery/index.html?appid=2d1250231f9e4ec184c983b62e0dcd33&group=9e6283b349a5446c95a63bbbc948e1e9) |
| 1. Please describe the potential extent of implementation in terms of geography, organization type (including other branches of government and private industry) and size, or other relevant factors. How broadly might the technology be deployed?

Every department within UDOT uses the data that has been collected in ways ranging from budget planning to management of a specific asset. Every individual within the State of Utah could potentially benefit from using the data that has been collected and organized. Already benefits are being realized from the biking community. Many others also utilize the Roadway Explorer to view the roadway without having to physically drive to a location. After completing similar data collection, organization, and analysis efforts, other state DOTs could adopt this technology and apply it to their specific needs. |
| **Market Readiness (30 points)** | The AII selection process will favor technologies that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential. | 1. What actions would another organization need to take to adopt this technology?

Collect: One of the first steps would be for a DOT to assemble a collaborative team to discuss what assets are found on the roadways, what methods are currently being utilized to obtain that data, and then how the data is being utilized. The next step would be to compile all the needs for each of the assets together into a combined data dictionary and then use that data dictionary to put out an RFP to hire a company to provide the services. It is very important for many areas to work together to make sure that the data dictionary and asset collection list is comprehensive and no area or asset attributes are missed. Organize: After determining the approach to collecting the data, one of the next steps would be to work within the DOT to develop a flow for what will happen to the data once it has been delivered. Because many times a DOT has multiple systems for using the same data sets, it’s important to figure out ahead of time how different areas and business systems will communicate with one another.  |
| 1. What is the estimated cost, effort, and length of time required to deploy the technology in another organization?

Collect: UDOT spent approximately 3 months developing the scope, requirements, and data dictionary for the RFP. The RFP was advertised for 1 month followed by a demonstration from each short listed vendor of their technology and process. From the time that the effort started to vendor selection was approximately 7 months. Now that vendors have experience collecting multiple assets and a sample data dictionary exists, this process could be much shorter. The collection process and post processing is approximately 6 months for a state with a similar size roadway network to maintain. The length of time for this effort is dependent on the vendor and the contract requirements. UDOT’s collection every two years ranges between $2 – 2.4 million depending on the specific assets and attributes that are collected each round. Some assets may not require collection every two years so the cost could be far less than this estimate. Organize: Perhaps the hardest aspect of the process to determine is the level of effort undertaken by the DOT itself to bring the different groups together in a collaborative effort and then the effort to put the data into business systems. This will range widely depending on the current abilities and integration efforts within the DOT. The cost for UDOT to integrate UGate was $1.08 million.  |
| 1. What resources—such as technical specifications, training materials, and user guides—are already available to assist deployment?

Collect: UDOT and other DOTs have RFPs and Data Dictionaries to assist with deployment. This is the link to UDOT’s RFP and addendum with the data dictionary: [Request for Proposal](https://www.udot.utah.gov/public/ucon/uconowner.gf?n=11823602292354098) and [Data Dictionary](https://www.udot.utah.gov/public/ucon/uconowner.gf?n=8336709567344270)Organize: Several DOTs have implemented **UPlan** and have lessons learned and implementation guides to share. This model is available to any DOT to adopt.Analyze: UDOT will share tools developed to date such as the Auto-Generator with other states interested in deploying this technology. |
| 1. What organizations currently supply and provide technical support for the technology?

Internally within UDOT the DTS (Department of Technology Services) and GIS provide technical support for the display and access of the data collected. Numerous vendors have the capability to provide data collection, organization and analysis support. |
| 1. Please describe any legal, environmental, social, intellectual property, or other barriers that might affect ease of implementation.

The main barriers to implementation were internal in nature. This was a new way of collecting and displaying data. There was a hesitancy by many to use data that was collected using an unproven method of collection (within the DOT) and not specifically by DOT employees. Now that the data is organized and accessible it is being used all over the DOT for a growing number of applications.  |
| ***Submit Completed form to*** | [***http://web.transportation.org/tig\_solicitation/Submit.aspx***](http://transportation1.org/tig_solicitation/Submit.aspx) |